**Game Changing Development**

# High Capacity Cryocooler (2020 Cooler)

Completed Technology Project (2014 - 2018)

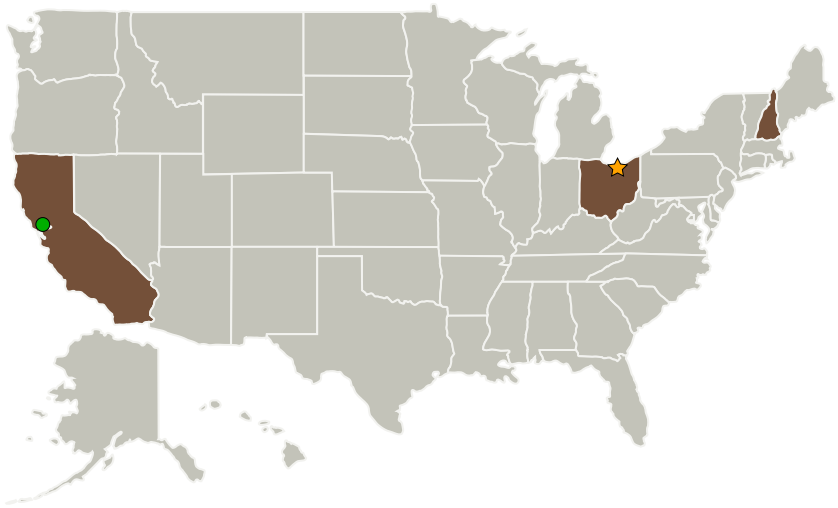
## Project Introduction

Advance the TRL of a 20W 20K cryocooler for use within a NASA future-defined Liquid Hydrogen Zero Boil Off test

## Anticipated Benefits

Benefits to NASA Funded Missions: Future exploration missions beyond Low Earth Orbit will require long-term (>2 weeks) in-space storage of large quantities (>4 metric tons) of Liquid Hydrogen without a significant loss of propellant due to boil off from radiation heat sources. Benefits to NASA Unfunded & Planned Missions: Large space-based platforms having science instrumentation (optics, focal planes) that require cooling from sub-Kelvin to 70k to reduce noise and isolate/detect desirable wavelengths (target emissions). Liquefaction of LOX and LCH4 propellants on Mars surface. Benefits to Other Government Agencies: DoD (Office of Naval Research, Air Force, Naval Research Laboratory, Naval Surface Warfare Center): Cooling optics for space telescopes and other instruments; superconducting electronics at 4K; power system for underwater crawlers. Benefits to the Commercial Space Industry: Interested in zero boil off liquid hydrogen for commercial depots and long durations missions. Benefits to the Nation: This item has significant benefit the nation with respect to space-based, high reliability, long duration, distributed cryo-cooling.

## Primary U.S. Work Locations and Key Partners




High Capacity Cryocooler (2020 Cooler)

## Table of Contents



## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Glenn Research Center (GRC)

**Responsible Program:**

Game Changing Development

**Game Changing Development**

# High Capacity Cryocooler (2020 Cooler)

Completed Technology Project (2014 - 2018)

| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Glenn Research Center(GRC) | Lead Organization | NASA Center | Cleveland, Ohio |
| ●Ames Research Center(ARC) | Supporting Organization | NASA Center | Moffett Field, California |

| Primary U.S. Work Locations | |
|---|---|
| California | New Hampshire |
| Ohio | |

### Project Transitions

**April 2014:** Project Start

**November 2018:** Closed out

### Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

## Project Management

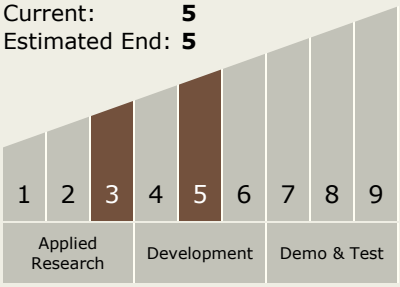
**Program Director:**
Mary J Werkheiser

**Program Manager:**
Gary F Meyering

**Principal Investigator:**
Michael P Doherty

## Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**




## Target Destinations

The Moon, Mars, Others Inside the Solar System